Additional File 17

Alignment of hypothetical p67*phox*-like (hypo-p67-L) proteins of *Arabidopsis thaliana*. The following names were used to describe species of sequences: At (as *A. thaliana*), Os (*O. sativa*). *Gray* and *yellow boxes* indicate the amino acid sequences of TPR and of PB1 domains, respectively.

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Athypo-p67-L1       MGKPTAKKKNPE-TPKDASGGGGGGGGKSGKTYHRSTSR---------------------- 38
Athypo-p67-L2       MGKPTGKKKNNNYTEMPPTESSTTGGGKTGKSFDRSATK---------------------- 39
Athypo-p67-L4       MGKSGGRKKKSGGSNSNSSQVNSSETSGLSKP-STIVNG---------------------- 38
Athypo-p67-L3       MEKQNEEISTDDAETSQSQLVDDSKVETLDDCVSKVETLDDCVSKVETLDDCVSKAETLA 60

Athypo-p67-L1       ------------------------------------------------------VFDEDME 45
Athypo-p67-L2       ------------------------------------------------------SFDDDMT 46
Athypo-p67-L4       ------------------------------------------------------GVDFDAS 45
Athypo-p67-L3       DCVSKVETLDDCVSKVKTLDDCVSKVENLDDCVPKVETLDDCVPKVETLDDCVSEVETLD 120

Athypo-p67-L1       IFISRALELKEEGNKLFQKRDHEGAMLSFDKALKLLPKDHIDVAYLRTSMASCYMQMGLG 105
Athypo-p67-L2       IFINRALELKEEGNKLFQKRDYEGAMFRYDKAVKLLPRDHGDVAYLRTSMASCYMQMGLG 106
Athypo-p67-L4       IFLKRAHELKEEGNKKFQARDYVGALEQYENGIKLIPKSHPDRAVFHSNRAACLIEMKPI 105
Athypo-p67-L3       DCVSKAQGLKEEGNKLFQKRDYDGAMFKYGEAIKILPKDHVEVSHVRANVASCYMQLEPG 180

Athypo-p67-L1       EYPNAISECNLALEASPRYSKALVRRSRCYEALNKLDYAFRDARIVLNMEPGNVSANEIF 165
Athypo-p67-L2       EYPNAINECNLALEASPRFSKALLKRARCYEALNKLDFAFRDSRVVLNMEPENVSANEIF 166
Athypo-p67-L4       DYESVISECSMALKSQPGFTRALLRRARAFEAVGKFDLAVQDVNVLLGSDPNHKDAGEIF 165
Athypo-p67-L3       EFAKAIHECDLALSVTPDHNKALLKRARCYEALNKLDLALRDVCMVSKLDPKNPMASEIV 240

Athypo-p67-L1       DRVKKVLVDKGIDVDEMEKDFVDVQPVCAARLKKIVKERLRKSKKKKKSGGKDEELKSPK 225
Athypo-p67-L2       ERVKKVLVGKGIDVDEMEKNLVNVQPVGAARLRKIVKERLR--KKKKKSM---------- 214
Athypo-p67-L4       EAVKNCLG-PHQDLQSRPFTCSSWCFGCFRRSYCWTWSCLPSRNVHKKGV---------- 214
Athypo-p67-L3       EKLKRTLESKGLRINNSVIELPPDYVEPVGASPAALWAKLGKVRVKKTKK---------- 290

Athypo-p67-L1       VVVVDKGDEAEGRNKPKEEK---SDKSDIDGKIGGKREEKKTSFKSDKGQKKKSGGNKAG 282
Athypo-p67-L2       ---TMTNGGNDGERKSVEAV---VEDAKVD-----NGEE------VDSGRK-----GKAI 252
Athypo-p67-L4       ---TSPVGSVSLPNLVMEGL---RGRQVVN-------------PVTENGGSVSKGQASRV 255
Athypo-p67-L3       ----SNQVEEKSEGEGEDVEPEKKNN-----------------VLAEKGKEKIKMKVKGK 329

Athypo-p67-L1       EERKVEDKVVVMDKEVIASEIVDGGGSKKEGATVTRTIKLVHGDDIRWAQLPLDSTVRLV 342
Athypo-p67-L2       EEKKLEDKVAVMDKEVIASEIK-------EDATVTRTVKLVHGDDIRWAQLPLDSSVVLV 305
Athypo-p67-L4       VLKPVSHSPKGSKVEELGSSSVAVVGKVQEKRIRWRPLKFVYDHDIRLGQMPVNCRFKEL 315
Athypo-p67-L3       QSDKRSDTSKEQEKVIIEEELLVIG-----VEDVNKDVKFVYSDDIRLAELPINCTLFKL 384

Athypo-p67-L1       RDVIRDRFPALRGFLIKYRDTEGDLVTITTTDELRLAASTH-------------DKLGSL 389
Athypo-p67-L2       RDVIKDRFPALKGFLIKYRDSEGDLVTITTTDELRLAASTR-------------EKLGSF 352
Athypo-p67-L4       REIVSSRFPSSKAVLIKYKDNDGDLVTITSTAELKLAESAADCILTKEPDTDKSDSVGML 375
Athypo-p67-L3       REVVHERFPSLRAVHIKYRDQEGDLVTITTDEELRMSEVSS-------------RSQGTM 431

Athypo-p67-L1       RLYIAEVNPDQEPTYDGMSNT---ESTDKVSKRLSSLADNGSVGEY---------VGSDKA 438
Athypo-p67-L2       RLYIAEVSPNQEPTYDVIDND---ESTDKFAKGSSSVADNGSVGDF---------VESEKA 401
Athypo-p67-L4       RLHVVDVSPEQEPMLVSRKKRRKMEEKPVIEEVISSPTESLSETEINTEKTDKEVEKEKA 435
Athypo-p67-L3       RFYVVEVSPEQDPFFG----------RLVEMKKLKITADSFKAKVN-----------GRG 470

Athypo-p67-L1       SGC---------FENWIFQFAQLFKNHVGFDSDSYVDLHDLGMKLYTEAMEDAVTGEDAQ 489
Athypo-p67-L2       STS---------LEHWIFQFAQLFKNHVGFDSDSYLELHNLGMKLYTEAMEDIVTGEDAQ 452
Athypo-p67-L4       SSSEDPETKELEMDDWLFDFAHLFRTHVGIDPDAHIDLHELGMELCSEALEETVTSEKAQ 495
Athypo-p67-L3       GCK---------VEDWMIEFAHLFKIQARIDSDRCLNLQELGMKLNSEAMEEVVTSDAAQ 521
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Athypo-p67-L1          ELFQIAADKFQEMGALALLNWGNVHMSKARKQVCIPEDASREAIIEAVEAAFVWTQNEYN 549
Athypo-p67-L2          ELFDIAADKFQEMAALAMFNWGNVHMSKARRQIYFPEDGSRETILEKVEAGFEWAKNEYN 512
Athypo-p67-L4          PLFDKASAKFQEVAALAFFNWGNVHMCAARKRIPLDESAGKEVVAAQLQTAYEWVKERYT 555
Athypo-p67-L3          GPFDRAAQQFQEVAARSLLNLGYVHMSGARKRLSLLQGVSGESVSEQVKTAYECAKKEHA 581

Athypo-p67-L1          KAAEKYEEAIKVKPDFYEALLALGQEQFEHAKLCWYHALKSKVDLESEASQEVLKLYNKA 609
Athypo-p67-L2          KAAEKYEGAVKIKSDFYEALLALGQQQFEQAKLCWYHALSGEVDIESDASQDVLKLYNKA 572
Athypo-p67-L4          LAKEKYEQALSIKPDFYEGLLALGQQQFEMAKLHWSYLLAQKIDISGWDPSETLNLFDSA 615
Athypo-p67-L3          NAKEKYEEAMKIKPECFEVFLALGLQQFEEARLSWYYVLVSHLDLKTWPYADVVQFYQSA 641

Athypo-p67-L1          EDSMERGMQIWEEMEECRLNGISK--------LDKHKNMLRKLELDELFSEASEEETVEQ 661
Athypo-p67-L2          EESMEKGMQIWEEMEERRLNGISN--------FDKHKELLQKLGLDGIFSEASDEESAEQ 624
Athypo-p67-L4          EAKMKDATEMWEKLEEQRMDDLKNPNSNKKEEVSKRRKKQGGDGNEEVSETITAEEAAEQ 675
Athypo-p67-L3          ESNIKKSMEVLENLETGKESEPSQ----------AGKTDCLTHEKDLGSSTQNNPAKE 689

Athypo-p67-L1          TANMSSQINLLWGSLLYERSIVEYKLGLPTWDECLEVAVEKFELAGASATDIAVMVKNHC 721
Athypo-p67-L2          TANMSSQINLLWGSLLYERSIVEYKLGLPTWDECLEVAVEKFELAGASATDIAVMVKNHC 684
Athypo-p67-L4          ATAMRSQIHLFWGNMLFERSQVECKIGKDGWNKNLDSAVERFKLAGASEADIATVVKNHC 735
Athypo-p67-L3          AGRLKSWIDILLCAVLYERSIMEYKLDQPFWRESLEAAMEKFELAGTCKDDVVEIISEDY 749

Athypo-p67-L1          SSESALEGNQFLARIPNSGQVTTQWFSVYNNLRTNAGMGFKIDEIVQAWNEMYDAKRWQM 781
Athypo-p67-L2          SSDNALEGN----------YVYL---------- 697
Athypo-p67-L4          SNEAAATEEMR----------KRYLRLET----------LYPNKNYDIKSYET 768
Athypo-p67-L3          VAGNTLRDIRFH----------MEEIIQIFDEIYEAKHWTN 780

Athypo-p67-L1          GVPSFRLEPMFRRRAPKLHDILENVFSGPV 811
Athypo-p67-L2          ------------------------------
Athypo-p67-L4          KTDSRLMNGCVTGK---------- 782
Athypo-p67-L3          GIPSDQLEEILKRRAENIFHVPNIAIQRG- 809
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Comparison of TPR and AD domain between hypothetical p67*phox*-like protein (hypo-p67-L) of plants and human p67*phox* (1-212 residues) and NOXA1 (1-213 residues) proteins. The following names were used to describe species of sequences: At (as *A. thaliana*), Os (*O. sativa*), and Hs (as *H. sapiens*). *Gray boxes* indicate AD region of human p67*phox* and NOXA1 and predicted AD-like region of At-hypo-p67-L1 and L2. *Red letters* indicate crucial residues in TRP (D67 and R102) and AD regions (V204) of human p67*phox*. *Asterisks* indicated positions of residues that were identified in Figure 5 as conserved residues among all activator proteins (p67phox, NOXA1, and hypo-p67).

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Hsp67phox              -MSLVEAISLWNEGVLAADKKDWKGALDAFS---------AVQDPHS--RICFNIGCMYTI 49
HsNOXA1                MASLGDLVRAWHLGAQAVDRGDWARALHLFS---------GVPAPPA--RLCFNAGCVHLL 50
Athypo-p67-L1          -IFISRALELKEEGNKLFQKRDHEGAMLSFDKALKLLPKDHIDVAYL--RTSMASCYMQMG 103
Athypo-p67-L2          -IFINRALELKEEGNKLFQKRDYEGAMFRYDKAVKLLPRDHGDVAYL--RTSMASCYMQMG 104
Oshypo-p67-L1          -VFLELSRELKEEGGRLFNRRDYEGAAFKYDKAVQLLPSGGHADAAAHLRTCVAQCYMRMA 80
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Athypo-p67-L3          -DCVSKAQGLKEEGNKLFQKRDYDGAMFKYGEAIKILPKDHVEVSHV--RANVASCYMQLE 103
Athypo-p67-L4          -IFLKRAHELKEEGNKKFQARDYVGALEQYENGIKLIPKSHPDRAVF--HSNRAACLIEMK 178
                                      **                      *

Hsp67phox              LKNMTEAEKAFTRSINRDKHLAVAYFQRGMLYYQTEKYDLAIKDLKEALIQLRGNQLIDYK 110
HsNOXA1                AGDPEAALRAFDQAVTKDTCMAVGFFQRGVANFQLARFQEALSDFWLALEQLRGHAAIDYT 111
Athypo-p67-L1          LGEYPNAISECNLALEASPRYSKALVRRSRCYEALNKLDYAFRDARIVLNMEPGNVSANEI 164
Athypo-p67-L2          LGEYPNAINECNLALEASPRFSKALLKRARCYEALNKLDFAFRDSRVVLNMEPENVSANEI 165
Oshypo-p67-L1          PAEHHRAIHECNLALEAAPRYSRALLRRAACFQALDRPDLAWEDVRTVLAWEPANRAAREI 142
Athypo-p67-L3          PGEFAKAIHECDLALSVTPDHNKALLKRARCYEALNKLDLALRDVCMVSKLDPKNPMASEI 164
Athypo-p67-L4          PIDYESVISECSMALKSQPGFTRALLRRARAFEAVGKFDLAVQDVNVLLGSDPNHKDAGEI 239
                       *          *   *  *                           *    **

Hsp67phox              ILGLQFKLFACEVLYNIAFMYAKKE-EWKKAEEQLALATSMKSEPRHSKIDK-------- 161
HsNOXA1                QLGLRFKLQAWEVLHNVASAQCQLG-LWTEAASSLREAMSKWPEGSLNGLDS-------- 162
Athypo-p67-L1          FDRVKKVLVDKGIDVDEMEKDFVD--VQPVCAARLKKIVKERLRKSKKKKKSGGKDEELK 222
Athypo-p67-L2          FERVKKVLVGKGIDVDEMEKNLVN--VQPVGAARLRKIVKERLRK--KKKKS-------- 213
Oshypo-p67-L1          SDKVRAALEEKGVLVLEKEPVPPPPEHKAVSAKGQGKLKKSHKQCDSAIEGQELIHVEDY 202
Athypo-p67-L3          VEKLKRTLESKGLRINNSVIELPPDYVEPVGASPAALWAKLGKVRVKKTKKS-------- 216
Athypo-p67-L4          FEAVKNCLG-PHQDLQSRPFTCSSWCFGCFRRSYCWTWSCLPSRNVHKKGVTSPVG---- 294
                        *       *

Hsp67phox              -----AMECVWKQKLYEPVVIPVGRLFRPNE----------------------------R 188
HsNOXA1                -----ALDQVQRRGSLPPRQVPRGEVFRPHR----------------------------W 189
Athypo-p67-L1          SPKVVVVDKGDEAEGRNKPKEEKSDKSDIDGKIGGKREEKKTSFKSDKGQKKKSGGNKAG 282
Athypo-p67-L2          ---MTMTNGGNDGE--RKSVEAVVEDAKVD-----NGEE------VDSGRK-----GKAI 252
Oshypo-p67-L1          EQSEKTELKINGQENGENRAGKEQFDCNVPVKQEIRTDQPEANGVGKHQYHMDDKENKGL 262
Athypo-p67-L3          ----NQVEEKSEGE--GEDVEPEKKNNVLAE----KGKEK-----IKMKVK-----GKQS 256
Athypo-p67-L4          --SVSLPNLVMEGLRGRQVVNPVTENGGSVS----KGQAS------------------RV 331
                                  *     * *
                                    AD
Hsp67phox              QVAQLAKKDYLGKATVVASVVDQD---------- 212
HsNOXA1                HLKHLEPVDFLGKAKVVASAIPDD---------- 213
Athypo-p67-L1          EERKVEDKVVVMDKEVIASEIVDGGGSKKEGATV 316
Athypo-p67-L2          EEKKLEDKVAVMDKEVIASEIK-------EDATV 279
Oshypo-p67-L1          DK---EGKNGKPGKHSAGKKIRRADAKKQKHSAM 293
Athypo-p67-L3          DKR--SDTSKEQEKVIIEEELLVIG---VEDV-- 283
Athypo-p67-L4          VLKPVSHSPKGSKVEELGSSSVAVVGKVQEKRIR 364
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